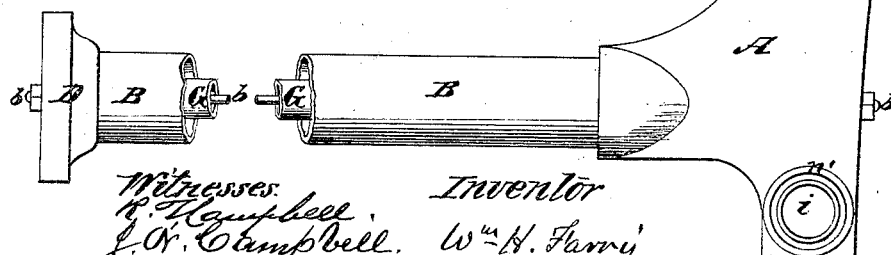
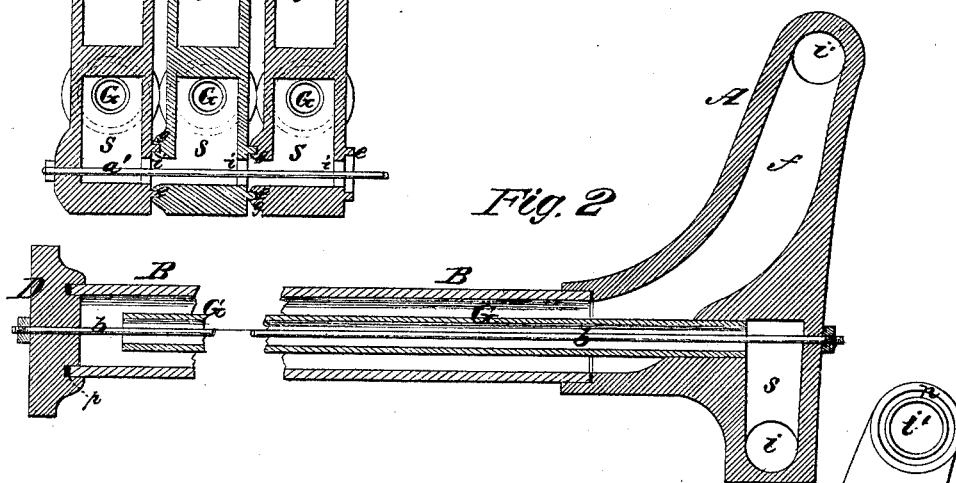
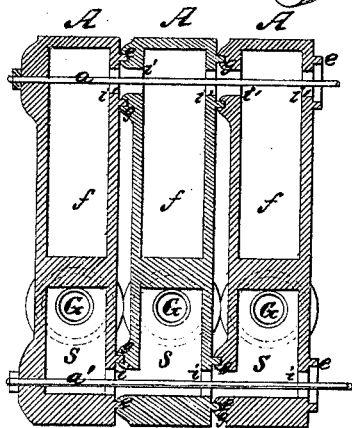
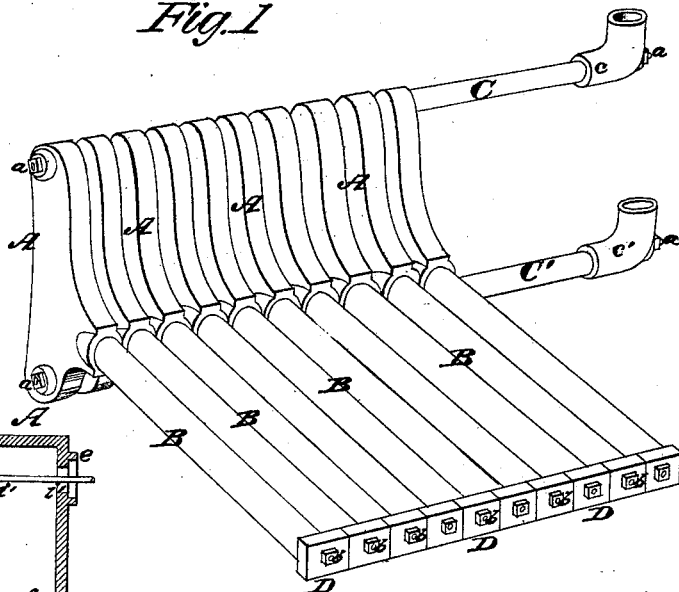



Improvement in Tubular Grate-Bars.

Patented May 2, 1871.



Witnesses:
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United States Patent Office.

WILLIAM H. FARRIS, OF CAIRO, ILLINOIS.

Letters Patent No. 114,280, dated May 2, 1871.

IMPROVEMENT IN TUBULAR GRATE-BARS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, WILLIAM H. FARRIS, of Cairo, in the county of Alexander and State of Illinois, have invented an Improvement in "Grate-Bars;" and do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing making a part of this specification, in which—

Figure 1 is a perspective view of the grate-bars connected together as I use them.

Figure 2 is a diametrical section through one of the bars and its fire-back.

Figure 3 is a side view of a grate-bar and fire-back with a section broken out.

Figure 4 is a vertical section taken transversely through the fire-bricks.

Similar letters of reference indicate corresponding parts in the several figures.

This invention relates to certain novel improvements on grates for steam-boiler furnaces, wherein hollow grate-bars are employed which are in communication with the water-space of the boiler so that water will circulate through the bars.

The nature of my invention consists—

First, in the construction of a hollow grate-bar upon one end of a fire-back, into which latter a small pipe is secured which receives water from a chamber in the back that communicates with the water-space of the boiler, and which discharges water into the hollow grate-bar and thence through said fire-back into the boiler again, as will be hereinafter explained.

Second, in the combination, of a hollow grate-bar, an internal pipe or tube, and a fire-back, which latter is constructed with an inlet-pipe and an outlet-passage or grate-bar proper, as will be hereinafter explained.

Third, in the combination, with a hollow grate-bar and a chambered fire-back, of an internal pipe or conduit and a cap to the free end of the grate-bar, as will be hereinafter explained.

Fourth, in the combination of a series of hollow grate-bars and chambered fire-backs, connected together, and constructed in such manner that the inlet and discharge of water shall be through each fire-back, as will be hereinafter explained.

To enable others skilled in the art to understand my invention I will describe it.

In the accompanying drawing, fig. 1, I have represented ten of my grate-bars connected together and provided with an inlet-pipe, C', for communicating with the water-space of a steam-boiler, and an outlet-pipe, C, for communicating with the steam-boiler near the water-line thereof. The bars are all constructed alike, so that a clear understanding of them can be given by a description of one bar and its connections.

A represents a fire-back which is constructed with openings *i i* communicating with a chamber, *s*, and also with openings *i' i'* communicating with an inclined passage, *f*.

Externally and on one side of the fire-back the openings *i i* are surrounded by annular sockets *n n'* for receiving short tubes *e e*, which are formed on a fire-back that lies adjacent to this back, as shown in fig. 4. On the opposite side of the fire-back tubes *e e* are formed for entering the annular sockets, as shown in fig. 4.

In this way and by means of suitable gaskets and tie-bolts *a a'* the fire-backs composing a full grate are securely bolted together so as not to leak at the joints.

The hollow grate-bar B is fitted into the fire-back A at the bottom of the passage *f*, and at the opposite end of this grate-bar a cap, D, is applied to it and made tight by means of an annular socket, *p*, and suitable packing, as shown in fig. 2.

Within the hollow grate-bar B is a tube, G, one end of which is screwed fast into the fire-back A so as to communicate with the inlet-passage *s*; the other end of the pipe G terminates within a short distance of the cap D, as shown in fig. 2.

By means of a bolt, *b*, with nuts on its ends, the cap D and the grate-bar B are firmly confined in place and secured to the fire-back A.

The packing or gaskets used at the joints may be made of India rubber, copper, or of any other suitable material which will make tight joints.

The bolt *a* passes through all of the fire-backs and through an elbow, *c*, and through the pipe C. The bolt *a'* passes through all of fire-backs through a pipe, C', and through an elbow, *c'*. In this way two bolts unite all the sections of the grate together transversely.

It will be seen from the above description that each grate-bar is free to expand and contract longitudinally independently of the others; also, that when the pipes C C' are connected to a steam-boiler, as above set forth, the chambers and passages in the grate will be filled with water.

When fire is made on the grate and heat communicated to the water therein, a circulation will be produced through each of the grate-bars, the direction of the currents being from the passage *s* in the fire-back A through the internal pipe G, thence into the space between the grate-bar B and pipe G, and back again through the passage *f*, and out at *i'*. Thus it will be seen that water is caused to circulate backward and forward through each grate-bar, entering at *i* and escaping at *i'*.

Having described my invention,
What I claim as new is—

1. The fire-back A, chambered at *s* and *f*, and pro-

vided with a hollow bar, B, and internal tube G, substantially as described.

2. The cap D, applied to the end of the hollow-bar B, in combination with the internal tube G, terminating near said cap and communicating with the inlet-passage s, substantially as described.

3. A series of chambered fire-backs, A, communicating above and below with one another, in combination

with grate-bars B, internal tubes G, and caps D, so constructed and arranged that the inlet and discharge of water shall be through each fire-back and grate-bar, substantially as described.

WM. H. FARRIS.

Witnesses:

Z. N. CAMPBELL,
EDM. F. BROWN.